

# **WINDING DEVICE OF WINDING WHEEL AND WIRE**

## **BACKGROUND OF THE INVENTION**

### **(a) Field of the Invention**

5     The invention relates to a winding device of a winding wheel and a wire (signal wire). More particularly, to a winding device, wherein when two ends of a signal wire are pulled out from breadths of a turning wheel thereof by force accepted, shear force at connecting portions of the signal wire and the wheel breadths is not resulted, thereby preventing  
10    damages of wire surfaces or conductive wires by eliminating stiff friction between the signal wire and the connecting portions.

### **(b) Description of the Prior Art**

Referring to FIG. 6 showing a typical winding device, "USB Transmission Cable having Cable Winding Mechanism" disclosed by  
15    Taiwan Patent Publication No. 529819, the invention comprises an elastically rotatable turning wheel A flexibly connected to a fixed shaft B, and a spring C having an inner end thereof fastened to the fixed shaft B and an outer end thereof fastened to a wall surface of the elastically rotatable turning wheel A. The turning wheel A has an encircling  
20    groove A1 at inner walls thereof, and two wedge apertures A2 and A3 at

a wheel breath thereof. A continuous signal wire W has a middle section thereof placed in the groove A1, and left and right wires W1 and W2 thereof stretched out via the wedge apertures A2 and A3 and are winded at an outer wheel breath of the turning wheel A in reverse directions. When the left and right wires W1 and W2 are extracted, the turning wheel A is rotated relative to the fixed shaft B as a center of rotation thereof, with the left and right wires W1 and W2 being pulled out by same lengths. However, wires that are pulled using such method in the long run are prone to the following drawbacks:

1. Referring to FIGS. 7 and 8, when the left wire W1 (or the right wire W2) is pulled to having reached a dead center, due to friction (shear force) at edges of the wedge apertures A2 and A3, contact portions A5 and A6 of the left and right wires W1 and W2 and end portions of the wedge apertures A2 and A3 are abraded and worn. In the long run, the left and right wires W1 and W2 may be resulted with breakage in conducting copper wires thereof, hence leading to poor contact.
2. Referring to FIG. 7, suppose excessive force is applied by a user at an end of the left wire W1 (or the right wire W2), the signal wire W is likely displaced toward a direction within the encircling groove A1.

Consequently, a released length of the left wire W1 (or the right wire W2) is greater than that of the right wire W2 (or the left wire W1).

When withdrawing to store the wire, an extra length of the left wire W1 (or the right wire W2) is remained behind and cannot be effectively stored back to the wheel breath.

In the view of the aforesaid drawbacks, it is a vital task of the invention as how to prevent damages or displacements of the fixed ends of the turning wheel and the wires due to pulling force when the wires are released from the turning wheel.

## 10 SUMMARY OF THE INVENTION

Therefore, a primary object of the invention is to provide a winding device of a winding wheel and a wire (signal wire), wherein when the wire is repeatedly withdrawn and pulled out from an elastically rotatable winding wheel, the wire is prevented from damages and displacements resulted from stiff friction between the wire and wedge apertures at wheel breadths.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an exploded elevational view according to the invention.

FIG. 2 shows a sectional schematic view illustrating the left and right wires being pulled to outer dead centers according to the invention.

FIG. 3 shows a sectional view of FIG. 2 taken along A-A'.

FIG. 4 shows a sectional view illustrating the left and right wires having been restored according to the invention.

FIG. 5 shows a sectional view of FIG. 4 taken along B-B'.

5 FIG. 6 shows a conventional exploded elevational view of a prior winding device.

FIG. 7 shows a schematic view illustrating the left and right wires being pulled to outer dead centers of the prior art.

FIG. 8 shows an enlarged planar view illustrating the wire in the prior  
10 art being abraded and damaged.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

To better understand the aforesaid objects, effects accomplished by the characteristics of the invention shall be given with the accompanying drawings hereunder.

15 Referring to FIG. 1, a device according to the invention comprises:  
an elastically rotatable turning wheel 10, when accepting force, capable  
of forward and reverse elastic rotations relative to a fixed shaft 20 to  
which a center of the turning wheel 10 is flexibly connected; wherein the  
turning wheel 10 has wheel breadths as a left wheel breadth 11 and a  
20 right wheel breadth 12, two transverse wedge apertures 13 and 14

disposed at the wheel breadths, an encircling groove 15 formed at inner walls thereof, and a center opening 18 flexibly connecting the turning wheel 10 to the fixed shaft 20; and

A continuously wire 50 with an appropriate section 54 thereof placed in the encircling groove 15, having defined left and right wires 51 and 52 by guiding one end thereof out to an exterior via the wedge aperture 13 and the other end thereof via the other wedge aperture 14; wherein the left wire 51 is folded in a reverse direction at an exit of the wedge aperture 13 to wind at the left wheel breadth 11, and the right wire 52 is winded in a forward direction at the right wheel breadth 12.

The characteristics of the aforesaid structure are that, a number of rounds of the left wire 51 winded at the left wheel breath 11 is at least one more than that of the left wire 52 winded at the right wheel breadth 12, and when the left and right wires 51 and 52 are released from the left and right wheel breadths 11 and 12 to having reached outer dead centers thereof, at least one round of basic coil 511 of the left wire 51 still binds tightly at the left wheel breadth 11 but not released along as shown in FIG. 2.

According to the above structure, similarly, a number of rounds of the right wire 52 winded at the right wheel breadth 12 may selectively be at

least one more than that of the left wire 51 winded at the left wheel breadth 11. When the left and right wires 51 and 52 are released to having reached dead centers thereof, at least one round of basic coil 521 of the right wire 52 still binds tightly at the right wheel breadth 12 but not released along.

### EXAMPLE

1. Referring to FIG. 1, an inner side of the turning wheel 10 having a constant outer diameter is accommodated by a spring 40. The fixed shaft 20 is fastened at an inner surface of a right casing 60, and a left casing 70 is fastened to the fixed shaft 20 by screwing a screw bolt 77 into a screw opening 22 at an end portion of the fixed shaft 20. The left and right casings 70 and 60 are joined by inserting an insertion column 62 into an insertion opening 72, so as to construct a wire winding mechanism and form wire storage chambers at upper spaces of the left and right wheel breadths 11 and 12. The spring 40 has an inner end 42 fixed to the fixed shaft 20, and an outer end 44 fixed to a wall surface of the turning wheel 10. Using the aforesaid structure, the turning wheel 10 becomes capable of elastically rotatable in both forward and reverse directions using the fixed shaft 20 as an axis of rotation. Referring to FIG. 2, the left wire 51 is guided out to an

exterior via an upper guiding orifice 74, and the left wire 52 is guided out via a lower guiding orifice 64.

Referring to FIGS. 4 and 5, the left and right wires 51 and 52 are completed stored into the storage chambers at the left and right wheel breadths 11 and 12 of the turning wheel 10. The characteristics of the invention are that, the left and right wires 51 and 52 wound at the left and right wheel breadths 11 and 12 are different with respect to numbers of rounds wound. A number of rounds of the left wire 51 (or the right wire 52) wound at the left wheel breadth 11 is at least one more than that of the right wire 52 (or the left wire 51) wound at the right wheel breadth 12 (or the left wheel breadth 11). When a user pulls to release the left and right wires 51 and 52 by applying an outward force, the turning wheel 10 rotates in a same direction relative to the fixed shaft 20 as an axis of rotation through torsional force received. Referring to FIGS. 2 and 3, when the left and right wires 51 and 52 are released to extremities (the outer dead centers) thereof in reverse directions, at least one round of basic coil 511 of the left wire 51 still remains and tightly binds at the left wheel breadth 11 (FIG. 2 shows two rounds of basic coil 511), so that torsional moment is evenly accepted by the basic coil 511, the left

wheel breadth 11 and the right wheel breadth 12. Thus, stress is not concentrated at contact points 131 and 141 of the wedge apertures 13 and 14 and the left and right wires 51 and 52, and resultantly frictional force is minimized by avoiding substantial shear force at the contact points 131 and 141. In addition, surfaces of the left and right wires 51 and 52 are not damaged nor cracked from being stiffly abraded, and a section 54 of the wire placed in the encircling groove 15 becomes less likely to slide and displace within the encircling groove 15 from force accepted, thereby preventing differences in lengths of the left and right wires 51 and 52 released from or stored to the breadths of the turning wheel 10.

Conclusive from the above, according to the invention, the difference in the number of rounds of the left and right wires 51 and 52 winded at the left and right wheel breadths 11 and 12 having equal outer diameters, is indeed capable of increasing stability and reliability of the entire wire 50 whether being released or stored, thereby overcoming a drawback as damages and displacements of the wire 50.

It is of course to be understood that the embodiment described herein is merely illustrative of the principles of the invention and that a wide variety of modifications thereto may be effected by persons skilled in the



art without departing from the spirit and scope of the invention as set forth in the following claims.